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THE MIAMI CONSERVANCY BULLETIN

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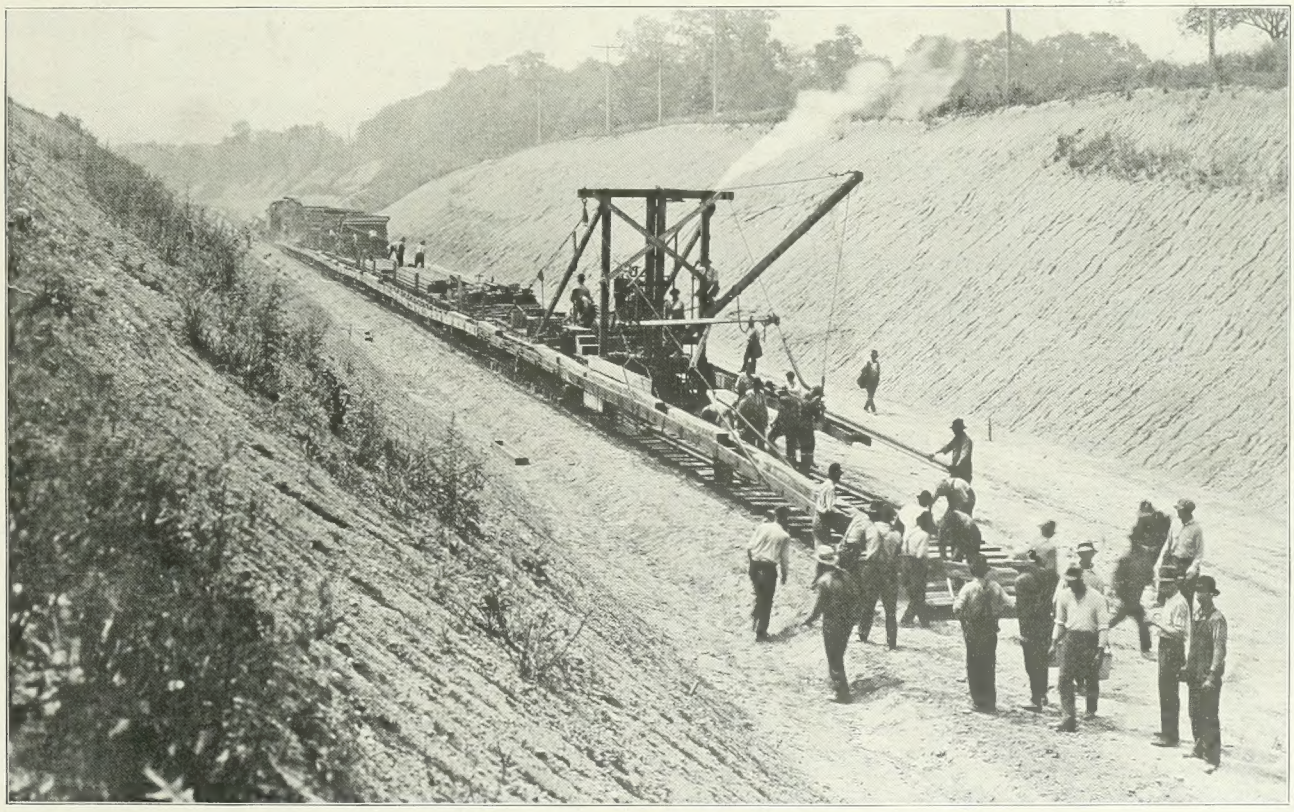
SEPTEMBER 1919



TRACKLAYING ON THE B. & O. RAILWAY RELOCATION, AUGUST 12, 1919.

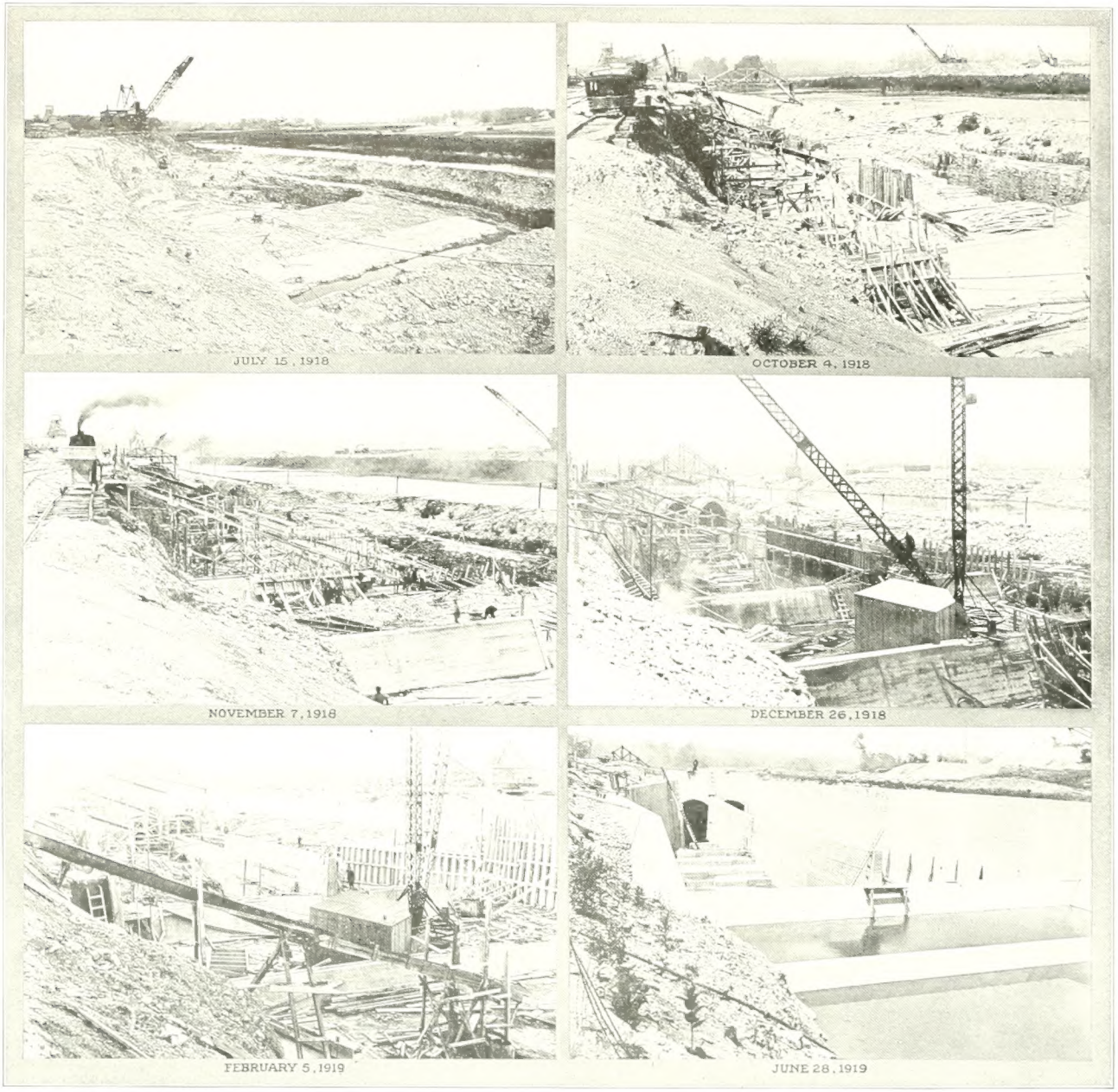


FIG. 16—PROGRESS PICTURES OF THE OUTLET STRUCTURE AT ENGLEWOOD.

Tracklaying Outfit—See Preceding Page.

All track materials—rails, ties, angle plates, spikes, track bolts, etc.—are carried on a train of "gondolas," or flat cars, pushed by a locomotive in the rear. The front car carries a hoist engine which also drives the mechanism transmitting power to the chutes which carry the ties and rails to the front of the train. Steam for the hoist engine comes through pipes from the locomotive. The chutes are built in sections and hung on the sides of the cars. Ties and rails are tumbled into the chutes, ties on one side and rails on the other, and ride forward on rollers driven by the derrick engine. At the front end they are taken by the men and placed on the railway grade. The chute for the ties (at the left) extends further ahead than the other, so that the ties can be laid first. The rails are lifted by the derrick by means of tongs which clutch them, balancing by the middle, so that they can be easily swung into line. Temporarily the rails are spaced by iron bridles which slip over their bases, and are linked end to end by the angle bars with a single bolt. Men following the train attach the other bolts and spike the rails to the ties. The process requires about 125 men and is capable of laying a mile and a half a day under favorable conditions.

Progress Pictures of Outlet.

Date is given below each picture. July 15, 1918, the excavation for floor and foundations is nearly complete. October 4, 1918, (at upper right) the stairway and the floor of the pools are completed, with part of the lower weir (at the right), and the forms are up for part of the walls. November 7 the forms are just in place for the first sections of the conduit arches. December 26 (at middle right), these first arch sections are completed. Over and beyond them is seen one of the scissors trusses which straddled the excavation, riding on trucks on a track on each side. This truss carried the concreting chutes. The derrick seen handled the concrete for the further wall, the excavation here being too wide to permit the material to be chuted (it coming in cars from the mixer on a track at the left). On February 5, 1919, (at lower left) the two downstream sections of the conduit arches are seen with the forms in place ready for the concrete. These downstream arches are flattened at the crown. This is to give the issuing water during flood a downward component of flow, thus helping to direct it into the hydraulic jump pool. June 28 shows the completed structure a short time before the river was turned into it.

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THE

MIAMI CONSERVANCY BULLETIN

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DAYTON, OHIO

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Subscription to the Bulletin is 50 cents per year. At news stands 5 cents per copy. Business letters should be sent to Office Engineer, Miami Conservancy District, Dayton, Ohio. Matter for publication should be sent to G. L. Teeple, Miami Conservancy District, Dayton, Ohio.

Walter M. Smith Goes to the Illinois Canal Link

Walter M. Smith, Designing Engineer for the District, has resigned his position to accept a similar one with the Board of Public Works of Illinois. The work in immediate prospect is the construction of the connecting link between the Chicago Drainage Canal and the Illinois River, which has been in contemplation for several years. It includes also, however, the design of a unified canal system, linking up with the railways for the entire State. The Chief Engineer of the project is Mr. Mortimer G. Barnes, with whom Mr. Smith has been in close association for the past thirteen years. Mr. Barnes was Mr. Smith's immediate superior on the work on the Gatun Locks at the Panama Canal, for the design of which Mr. Smith was largely responsible. The two men were also later associated in partnership as consulting engineers. The return to this old and close connection is a pleasant and noteworthy feature of the change. Besides the work on the Gatun Locks, Mr. Smith was largely responsible for the design of the Kensico Dam at Valhalla, N. Y., the largest masonry dam in the world, where he introduced changes which effected a large saving. For the Conservancy District his principal work has been on the structural design of the concrete outlet works at the dams. This work is now far advanced, so that the District, while greatly regretting Mr. Smith's departure, will not suffer from it as otherwise it might. The immediate new work, involving an estimated expenditure of some $20,000,000, is of a nature for which Mr. Smith's training particularly fits him, and his associates of the District wish him and expect for him the greatest success in it.

New Devices at Englewood

At two of the dams—Englewood and Germantown—the material for the earthen portion of the dam, which is excavated by dragline excavators working on the valley floor near the damsite, is transported in cars and dumped into a "hog box" at the toe of the dam. From this it is washed by powerful water jets into a concrete "sump" or cistern, whence, mixed with from ten to twenty times its volume of water, it is pumped to the hydraulic fill pool on the top of the dam. On the way from the "hog box" to the sump it passes through gratings or "grizzlies" which screen out all the boulders exceeding six inches in diameter, these being too large to pass through the pumps. Until recently the screened out boulders have been removed by men, who also removed roots, etc., and broke up any clay masses too large to pass through the meshes of the "grizzly."

At Englewood not long since two rotary "grizzlies" (one for each dredge pump), have been put in, replacing the old ones, and rendering most of the labor of the attendants unnecessary. These screens are of a type much resembling the ordinary rotating screen used for gravel. The main feature is a rotating hollow cylinder of boiler plate open at both ends and punched with six-inch holes. The material is washed into one end by the hydraulic monitors of the "hog box." The cylinder being set on a slant, the boulders roll down hill and out at the lower end into a bucket, which is periodically hoisted away and dumped in a car by a derrick. All earth and rock smaller than six-inch size drops with the water through the holes in the cylinder into the sump.

The drum rotates on rollers driven through belting and gears by an electric motor.

In use the new "grizzlies" have proved very successful, and they will soon be introduced at Germantown, and also at Huffman, where a similar general method of hydraulic fill is to be employed.

At Taylorsville and Lockington the excavation in the borrow pit is by hydraulic "monitor" instead of by dragline excavator, and the large stones remain in the pit. Hence at these dams the new "grizzlies" are unnecessary.

Another recent improvement, due to Mr. Knerr, the chief electrician at Englewood, is an electrical indicator which registers instantly in the pump house any drop below standard pressure at the dredge pipe outlet.

The effect of the two improvements, together with the installation of new pumps and pump runners, has been to increase the input of hydraulic fill material at Englewood about 50 per cent—from 4000 cubic yards to 6000 cubic yards. The new "grizzlies" steady the feed of earthy material to the pumps. The new indicators give speed and delicacy to the pump control, thus saving stoppages due to choked suction and dredge pipes.

A detailed account of these devices will be given later.

Progress on the Tracklaying

The tracklaying outfit illustrated on our outside front page is now at work about three-quarters of a mile north of the National Road, leaving only two miles more on the B. & O. Railway to be completed. This does not include the ballasting. The pit for the latter is open, however, the track connection from the new railway to the pit, on the valley bottom just below Taylorsville dam, has been made, and this work will soon begin. The tracklaying outfit, on completion of that work on the B. & O., will begin operations on the Big Four and Erie in the Mad River Valley. The work on the big railway cut at Huffman Dam, to make way for these roads, is rapidly nearing its end, and material for the tracklaying is being received.

Effect of Dry Wave on Conservancy Camps

The following quotation from a letter to Mr. Morgan from Mr. McCurdy, the division engineer at the Englewood Dam, is interesting as a bit of evidence regarding results of the dry edict which went into effect on June 28.

"It is interesting to note that, while heretofore we sold coupon books averaging to the value of $75.00 weekly, for the past four weeks we have not sold a single book.

"Also, at the bunkhouses the ordinary Saturday night and Sunday trouble is reduced almost to nil.

"It is not an accident that this change coincides closely with the absence of liquor from sale and storage."

The evidence at all five of the Conservancy Construction Camps is of the same general tenor and indicates an excellent influence of the new laws in improving the Saturday night and Sunday conditions as to quiet and order in the bunkhouses. At Germantown there was also a marked effect in bettering the labor turnover.

The evidence of the coupon books, while significant as indicating that the men under dry influence, no longer "go broke" so as to need them, is peculiar to Englewood. At the other dams the coupons still continue in use. These books, issued on wages due, and good for merchandise at the camp stores, are regarded as a convenient cash account of household expenditures, and are regularly used by those who have no need for credit at all.

Conservation of Dayton Trees

Dayton takes just pride in the trees which give beauty and dignity to her parks and avenues. She has had the benefit of the advice and direction of some of the masters in American landscape architecture in regard to them, and its natural that she should look with concern at any feature of the Conservancy work which might appear to threaten them with harm.

With this feeling the authorities of the District are in full accord and the plans for the work along the river have been made with the matter very definitely in view. This appears in the method now being used in raising the levees along the left bank, above Herman Avenue bridge. This work would have been easiest done by the big dragline when the river channel was being excavated, but the swing of the heavy bucket would have practically destroyed the row of trees now growing on the face of the levee. The earth is therefore being brought in dump cars running on a track laid on the top of the embankment, and dumped in a manner to work no harm. These same procedure will be followed on the right bank all the way from McKinley Park to Island Park.

There are places, however, where the trees cannot be saved. The paramount motto of a flood protection project must, of course, be "safety first." This demands the taking out of present irregularities in the river banks and the widening of the channel so as to permit the freest possible flow of flood water. This means that in places the present levees be cut back and re-aligned, and when this occurs, trees sometimes must be removed.

An instance recently occurred along the McKinley Park levee near the new sewer outlet. The face of the old levee here had to be shaved back by the big dragline in a slice of considerable thickness, and the trees necessarily were cut away with the earth they were rooted in. The same thing will happen in the near future on the east bank between Third and Fifth Streets.

These things are regrettable, but they are unavoidable. Where trees and residences stand in the road of public safety they must, of course, be set aside. Every consideration is given them. They are saved wherever possible. Where they are destroyed or removed it is only after careful consideration.

Concrete Forms for Conduits

One of the leading articles in the next Bulletin will be by Walter M. Smith, on the design of the forms for the conduits at Englewood and Germantown. Several ingenious features were introduced into these to facilitate collapsing and repeated use.

The Outlet Conduits at Englewood

Two Parallel Concrete Tunnels 709 Feet Long, to Carry the Stillwater River Through the Base of a Dam 4716 Feet Long and 122 Feet High.

By H. S. R. McCurdy.

The Englewood Dam is located on the Stillwater River about 9 miles northwest of Dayton. It is the largest of the Conservancy Dams, being 4716 feet long, 122 feet high above the existing river bed, and will contain 3,500,000 cubic yards of earth, or about 45% of the total embankment in all of the dams. In a flood similar to that of 1913 the Englewood Reservoir would hold in storage 209,000 acre-feet of water, or sufficient to cover 209,000 acres one foot deep.

This vast storage of water embodies the flood control element of the system, representing as it does the action of the retarding basin in holding back from the cities and valley below the dam the onrush of the flood waters.

Egress from the retarding basin is through the outlet conduits in the dam. It is by means of this structure that the delicate refinement of flood control is accomplished. In harmony with the other four Conservancy dams the size of the conduits is so figured that in a flood 40 per cent greater than that of 1913 they will pass just such a flow of water as can be safely accommodated in the improved channels downstream. The measure of protection afforded can be judged by the fact that in a flood such as occurred in 1913 the flow of the Stillwater River at Englewood damsite would be cut down from 85,000 to 11,000 cubic feet per second, a reduction of 87 per cent.

A most desirable condition for the building of a masonry conduit through an earth dam is a solid rock foundation. It was known from the boring investigations that such existed at all of the proposed damsites for the Conservancy District. But at Englewood, as also at some of the other damsites, expectations were exceeded in this respect, a condition of the rock substrata being developed by the excavation operations which was even better than was anticipated and eminently fitted for the purpose it was to serve. The nature of this rock is clearly revealed in the illustration on page 155 of the May Bulletin.

The Englewood outlet structure has a total length of 1060 feet, of which 709 feet is double-barreled covered conduit. The thickness of concrete in the sides of the conduits is from 18 inches to three feet and the crown of the arch is between 15 inches and 27 inches thick, depending upon the depth of earth cover the particular portion is called upon to sustain. Each conduit is 13 feet inside width and the temporary depth is 22½ feet. This depth, however, is for construction purposes only and will later be reduced to 10½ feet by filling in the bottom with compacted gravel and building

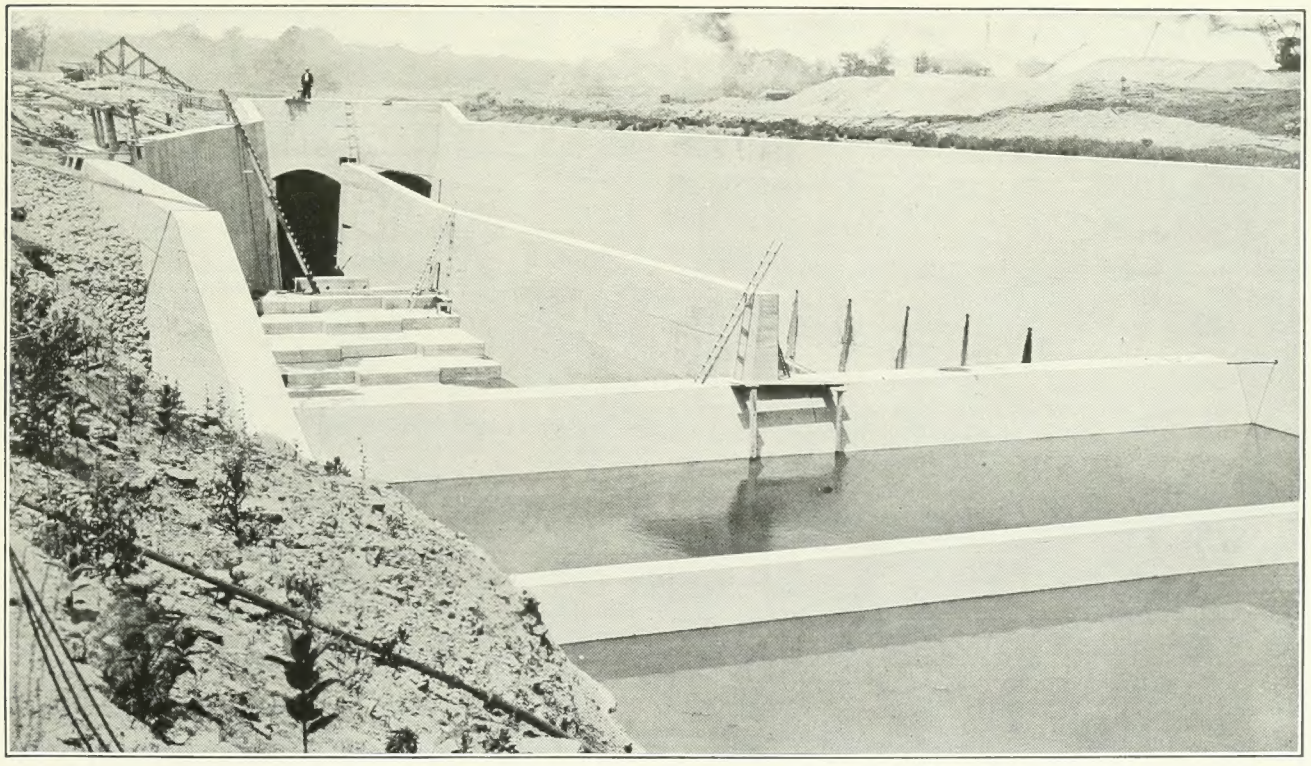


FIG. 17—OUTLET STRUCTURE AT ENGLEWOOD, JUNE 28, 1919.

This shows the completed structure before the river was turned through it. The openings below the man are at the downstream end of the conduits. The stairway leads the issuing stream down into a wide, deep pool and against the further of the two cross walls. It must surmount this wall to reach the second pool (the further pool of the two seen). Crossing this pool is must surmount the nearer cross wall, thus reaching a short concrete floor which carries it to the downstream river channel below.

thereupon the permanent concrete floor. The final size will be as shown in Fig. 18. The reason for the increased depth during the construction period is that it is not desirable to realize the full retarding effect of the permanent conduits until such time as the dam shall have reached such a height as to be free from danger of overtopping.

The surfaces of the conduits, wherever they are to be exposed to the flowing water, were given a smooth finish, not on account of appearance, nor even to give a maximum discharge, but to offer no foothold, however minute, for the rushing water to start erosion. This is in accordance with the demand for permanence which has guided the construction throughout. When it is considered that during maximum flood the water in the conduits will attain a velocity of 60 feet per second (over forty miles per hour), it will be seen that such precautions are vital.

To reduce this velocity to one which could safely be allowed to pass into the natural river channel, the outlet end of the conduits discharges into a flaring basin, the bottom of which is formed of concrete steps, down which the water will cascade, and across the end of which, to further baffle the tendency of the water to rush on, are two concrete weirs, or walls. Passing through this stilling basin, the ambition for destruction of the flowing water is so thoroughly curbed that it passes into the river channel at a speed of not more than 6 feet per second, a reduction of 90 per cent. To admit the flow into the conduits with as little disturbance as possible, the upstream end is funnel shaped, with the inlet into the covered conduits rounded to an easy curve.

Excavation on the outlet works was begun May 10, 1918, and continued to November 13, 1918, during which time 8,000 cubic yards of earth and 58,000 cubic yards of rock were excavated. This work was handled by means of a large steam dragline excavator equipped with an 85-foot boom and a 5-yard bucket. The machine moved ahead along the line of the conduit, digging behind itself as it went and depositing the material in 12-yard side dump cars on a standard gage track beside the excavation. A portion of the excavated material was transported and dumped into a waste pile located along the river downstream from the dam. The remainder, principally rock, was placed at the downstream toe of the dam near the outlet from the conduits, to serve as a shield to prevent the backwash from the outflow through the conduits during flood eating away the earth at the downstream toe of dam.

The operation of the dragline necessarily left the surfaces of the rock cut in ragged condition, with numerous projecting loose fragments. As it is necessary that the concrete of the conduits form contact only with absolutely solid rock, final cleaning and trimming were done by hand-quarrying methods.

The dragline method of excavation worked down the cut to grade before moving the machine ahead and thereby enabled concreting to start before completing the cut to its full length. Concreting at Englewood began August 10, 1918, and was finished June 7, 1919. A total of 19,000 cubic yards was placed. An uncommon feature of this work is that during the winter months, when ordinarily concreting operations are either suspended entirely or proceed under most trying conditions, an average output was consistently maintained fully equal to that of the warmer months. This fortunate circumstance was due, of course, to the unusually mild winter weather and the absence of snow storms.

The cement used was of a well-known standard brand and was tested before using by a laboratory of established reputation. No cement failing to pass the recognized standard requirements was released for shipment to the work. Sand and gravel were furnished by the large draglines sending material to the dam and by a smaller dragline operating solely for this purpose. The material was run into the screening plant (described in the April Bulletin) in the regular 12-yard cars and separated into three sizes, two of gravel and one of sand. These were stored in overhead bins and flowed by gravity to the concrete mixer. Side-hopper steel cars of one cubic yard capacity on narrow gage tracks received the mixed concrete from the concrete mixer and were hauled by a gasoline locomotive on a track laid alongside of the conduits to the place of depositing. Here the car discharged into chutes through which the concrete flowed by gravity into place. Spading gangs, skilled in the art of working concrete, manipulated the soft mixture in such a manner as to expel surplus air and water and insure the utmost consolidation.

Particular attention was paid to the aggregates, i. e., the sand and gravel, entering into the concrete. Each day a representative sample of sand was taken from that entering the mixer. By shaking this sand violently in water, the clay and silt mixed with it were washed out and their amount determined. The sand was also sifted through sieves with standard openings, to ascertain the proportions of the various sized grains. Granting that a particular sand is clean, and that its grains are composed of durable mineral matter, a determination of its mortar making qualities is quickly made by comparing its sieve analysis with those of other sands from the Miami Valley which had previously been mixed into con-

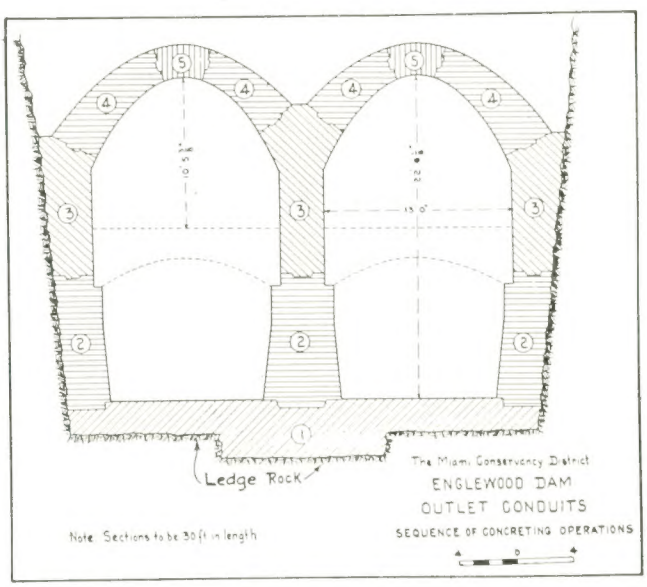


FIG. 18—SECTION OF ENGLEWOOD CONDUITS.

Shows the setting of the conduits in the ledge rock, and also the five successive steps in the pouring of the concrete, longitudinal joints being introduced at each stage.

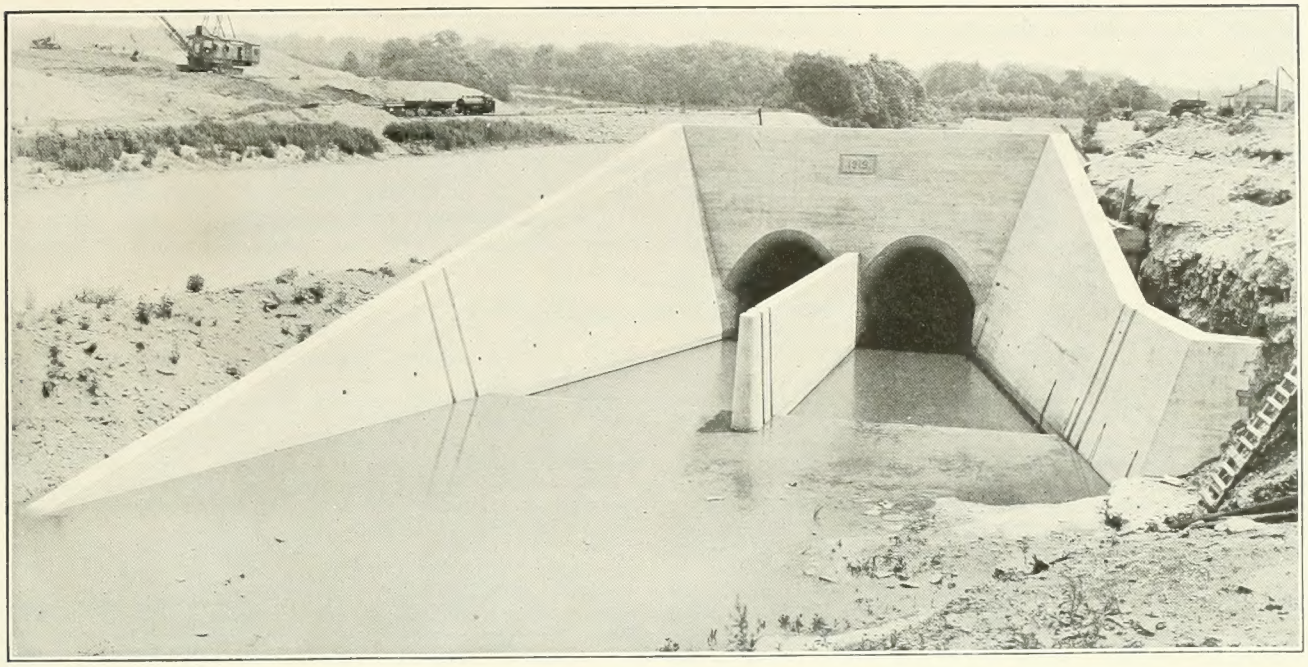


FIG. 19—STILLWATER RIVER ENTERING ENGLEWOOD CONDUITS, JULY 28, 1919.

The river was turned into the conduits two days before this picture was taken. The old bed appears at the left. It was blocked by a low cross dam at each end of the conduit structure, and has since been pumped out and the bed thoroughly cleaned of all objectionable materials by a dragline excavator, the digging in most places reaching ledge rock. The notches in the walls are to receive timbers in case either conduit needs repair, the timbers constituting a dam.

crete and tested. The gravel entering into the concrete was also carefully examined from day to day to see that it was free from dirt.

Another refinement entering into the construction of the conduits was the adjustment of the amount of cement entering into the concrete used in the various parts of the structure, the amount being greater where greater strength or wearing quality was needed. For instance, in the face of the walls of the entrance and outlet of the conduits at the level where the water will stand during the greater part of the year additional cement was used in the mixture. The reason for this is that during the winter the alternate freezing and thawing at the surface of the water has a tendency to cause disintegration, and consequently at this particular point greater weather-resisting qualities are desirable in the concrete than elsewhere in the walls. Similarly, in a thick retaining wall, the face of which is exposed to swiftly-flowing water, more cement was used in the mixture along the face than in the backing of the wall. Also in the portion of the center wall at the inlet, which will be exposed to buffeting from floating logs or other objects, a much stronger mix was used than would be dictated by considerations of strength alone.

The foregoing adjustment of mixtures was, of course, in addition to the proportions as nominally determined upon for the various parts of the structure, depending upon the stresses the particular concrete is called upon to sustain. Inasmuch as the cement is by far the most costly ingredient entering into the mixture it is obvious that its content should be as low as practicable without sacrificing any of the qualities essential in the finished product. Following this reasoning, a number of standard mixtures were selected. In all cases the amounts of sand and gravel were constant, the variation in the mix being governed by the number of sacks of cement added. Thus, a 5-bag mix gave proportions by volume of 1 part cement to 2.8 parts sand, to 5.6 parts gravel, and an 8-bag mix gave proportions of 1 part cement to 1.75 parts sand, to 3.5 parts gravel. Other numbers of sacks gave mixtures in proportion.

At frequent intervals cylinders of concrete, 6 inches in diameter and 6 inches long, were cast from the material as it was being placed. These were stored in damp sand or sawdust to insure proper seasoning and tested for comparison. The results of these tests appear in the following table, the last column giving the breaking strength under compression.

Sacks	Proportions	Number of Specimens	Lbs. Per Sq. In. At 3 Months
5	1 :2. 8 :5.6	15	2880
6	1 :2.33 :4.66	30	2573
7	1 :2 :4	6	more than 3300*
8	1 :1.75 :3.50	9	" " 3300*

When it is considered that the concrete will not be called upon to sustain stresses in excess of 500 lbs. per sq. in. it will be seen at a glance that no apprehension need be felt as regards the safety of the structure.

The average quantity of cement per cubic yard in the entire 19,000 cubic yards was 1.57 barrels.

In order to provide for internal stresses in the concrete due to shrinkage in setting, and partly to facilitate casting, the conduits were built in 30-foot lengths and brought up to their full height in several separate operations. This will be made clear by reference to Fig. 18. Movable forms were devised by the designing division which could be used repeatedly throughout the concreting operations.

*Exceeded capacity of testing machine.

By striking wedges and setting up turnbuckles the form was pulled free from the hardened concrete and rolled to its new position on casters attached to the bottom timbers.

As a final preparation for service the exposed surfaces of concrete were given a light coat of a thin mixture of cement, water and small quantities of hydrated lime and fine sand. This mixture penetrating any pin holes in the face of the concrete adds to its durability.

The conduits were put into actual service on July 26, when the old channel of the Stillwater River across the damsite was blocked by a temporary cross dam and the flow diverted through the conduits. The work was done under the supervision of H. S. R. McCurdy, Division Engineer, H. W. Horne, Assistant Division Engineer, and Richard Byers, Superintendent of Construction.

August Progress on the Work

GERMANTOWN

Fair progress was made during the first month of pumping. Some difficulty was experienced with the equipment. The locomotives were under repair for a portion of the month, which of necessity reduced the amount of material that could be delivered to the pumping plant. Some trouble was also experienced with the cast iron runners catching too many rock. This difficulty was overcome by the substitution of manganese steel runners of new design. The rocks that will not pass through the grizzly are being stored for use in the gutters on the dam.

Three towers for obtaining the earth pressure in the dam are in progress of erection. These towers are located in the old channel of Twin Creek.

A clay blanket is being spread on the old creek bed preparatory to placing the hydraulic fill in this portion of the dam. In one portion of the old channel, teams with wheeled scrapers are being used; at another place a hoist engine has been rigged to a fresno for the purpose of spreading the clay; at still another the Marion dragline is being put to this use

Arthur H. Pauls, Division Engineer.

August 15, 1919.

ENGLEWOOD

During the latter part of July the cofferdams across the bed of the Stillwater River at the upstream and downstream toes of the dam were completed and the flow of the river diverted from its old course through the outlet conduits. A steam dragline has since been working over the abandoned river bed, clearing off loose material and preparing a foundation for the embankment of the dam.

Work on the cross dam is progressing steadily, the embankment now having reached a height of forty feet, or two-thirds of its projected height. Owing to the narrowing in of the top, however, the yardage remaining to be done is comparatively small.

Slightly over 100,000 cubic yards of embankment were placed in the dam during July, bringing the total to the end of July to about 525,000 cubic yards, and showing a completion to date of 15 per cent. Revolving screens, to discard all oversize rock from the material being fed to the dredge pumps, have been installed in place of the square gratings formerly used. Not only has the progress been greatly accelerated by this change, but the unit cost of embankment is being correspondingly reduced. On August 14 over 6,500 cubic yards of material were pumped into the dam during the 20 hours covered by the day and night shifts, establishing a record.

The graveling of Highway No. 4 is nearing completion.

H. S. R. McCurdy, Division Engineer.

August 15, 1919.

LOCKINGTON

The upper toe of the dam, west of the outlet structure, has been completed to elevation 904, about 19 feet above the main valley floor. This forms a dyke across the river bottom of sufficient height to protect from extreme flood that part of the earth fill lying west of the new channel. The material was excavated by the Class K Dragline from the cut-off trench and placed while in the wet condition. The lower toe of the dam is being built by hydraulic fill, the dredge pumps working day and night shifts. To date most of the fill has been placed by one pump. The second pump will go into regular service within a short time.

The western 3100 feet of the dam is comparatively low, being upon high ground. This is being built by the large dragline with material excavated from a pit extending along the north side of the fill. Water for compacting the earth is being pumped from Loramie Creek into the borrow pit.

Road No. 10 was let by contract and graded during the month. Work on Road No. 9 is progressing favorably. Approximately 3000 feet of it have been graded and graveled, the culverts are all built and a concrete slab bridge is being built at Lockington for carrying the road over the Sidney feeder of the Miami and Erie Canal. Some clearing and grubbing is being done on Road No. 8.

The steel bridge on Buxton Pike over the outlet channel was opened for traffic on July 25.

During the month the Class B Dragline has been occupied in placing selected backfill behind the east wall of the outlet structure, in loading trucks with gravel for Road No. 9 and in stripping soil from the low marsh ground lying east of the outlet works.

The gravel washing and screening plant, out of service until next year, when it will again be needed for building the spillway weir, has been leased until the end of this year. The product is to be used for building concrete roads.

B. M. Jones, Division Engineer.

August 18, 1919.

TAYLORSVILLE

The rock excavation for the outlet works, being done by the big Lidgerwood dragline, is still progressing a little faster than the estimated rate, as has been the case for the past three months. There has been only a few yards' difference in the monthly records of this machine during this period.

The progress on the sluicing has been only fair as a new borrow pit is being opened up and all of the water lines have been relocated on account of the relocation of the railroad off the east end of trestle No. 2. This shut the pumps down for ten days.

The Marion steam shovel is constructing the new loading track around the north end of the excavation for the concrete.

Trestle supports for the concrete track and derricks have been started at the south end of the outlet excavation. The base of the derricks and the concrete track will be carried at elevation 760, which is 34 feet above the lowest point on the foundation and 77 feet below the top of the walls. We plan to start concreting about the middle of September.

The concrete bridge over the B. & O. R. R. has been finished.

A pit has been stripped south of the damsite from which gravel ballast will be dug for the new B. & O. railway tracks.

O. N. Floyd, Division Engineer.

August 16, 1919.

HUFFMAN

The large electric dragline has completed the excavation of the outlet channel, with the exception of a cofferdam across the lower end to hold out the back water from Mad River until the concrete work has been completed. The dragline will now be used to clean out all objectionable material from the old bed of Mad River. This is done in preparation for the embankment. The dragline will then be taken to the main borrow pit to excavate material for the earthen part of the dam.

Concreting in the outlet works has been progressing very satisfactorily during the past month. The steps and floor have been completed to the lower end of the hydraulic jump pool, the first weir is about fifty per cent completed, and the side walls are built to their full height as

far as the downstream toe of the dam. The sections of the wall below this point are up to various elevations.

A small cross dam has been built north of the diversion channel so that the placing of the hydraulic fill can be started before Mad River is diverted through the outlet works.

All of the foundation work for the hydraulic pumping plant has been built and the installation of the plant itself is under way.

C. C. Chambers, Division Engineer.

August 19, 1919.

DAYTON

Channel excavation to date amounts to 483,000 cubic yards. A total of 373,500 cubic yards has been placed in levees and spoil banks, including 60,000 cubic yards of levee embankment on Contract No. 41. In accomplishing this work a total of 809,000 cubic yards has been handled.

The D-15 large dragline, which was placing material in the spoil bank along the north side of Mad River below Webster Street, completed that work. It then crossed the Miami River to the spoil area on the west bank below Herman Avenue, where it has completed excavating the canal to be used for transporting material on scows into the spoil bank.

In the meantime the other large dragline has been working near Dayton View Bridge. It excavated approximately 3000 cubic yards of sand and gravel, which were transported to Price Bros.' concrete block plant, and 8000 cubic yards which it placed directly in the spoil bank on the north side of the river.

The 20-inch water main which crosses under the bed of the river above Dayton View Bridge has been lowered to the new grade for a length of 300 lineal feet.

The concrete extension of the storm sewer at McKinley Park has been completed. Excavation has been started for the construction of a concrete retaining wall on the north bank of the river just west of Main Street.

The enlargement of the levee on the east bank of the river between Island Park Dam and Herman Avenue has been started. The material for it is excavated from the main channel by the caterpillar dragline, loaded into dump cars of 4 cubic yards capacity, and hauled along the top of the old levee by two 6-ton gasoline locomotives.

Good progress is being made with the erection of the gravel washing plant at the mouth of Wolf Creek.

Scow No. 2 is being repaired in the Sunset Avenue dry dock.

At Price Brothers' plant 109,000 blocks for the flexible concrete revetment have been completed. This is about 62 per cent of the total quantity required for the work at Dayton.

C. A. Bock, Division Engineer.

August 18, 1919.

HAMILTON

The total excavation for the two draglines, to August 1, was 714,000 cubic yards. The electric dragline has begun just south of the railroad bridge, on a cut 150 feet wide along the center of the channel, and is working south toward the Columbia Bridge. During the past two weeks seven standard gauge car trucks have been removed from the river. Several cars and a large amount of bridge steel have also been encountered. The cars fell with the bridge in the 1913 flood, having been pushed out on it in an attempt to hold it in place.

The steam dragline is working on the levee south of the tail-race at the Ford plant.

The asphalt paving over the Buckeye Street sewer has been completed and all work on the Wood Street sewer except the paving, which will be done as soon as the backfill has settled sufficiently. Excavation on the Front Street sewer has been completed for a distance of 150 feet.

Frank McGillicuddy & Co. have started work on the channel excavation north of Black Street on the east side of the river. The material is being hauled to the north spoil bank, through the B. & O. underpass, and filled in around the Ford tractor plant. The equipment on this work consists of a Marion model 70 steam shovel, 4 18-ton dinkeys and 42 4-yard dump cars.

C. H. Eiffert, Division Engineer.

August 18, 1919.

RAILWAY RELOCATION

Baltimore and Ohio. The grading for the relocation will be completed before the end of the month, Condon & Smith's shovel being the last one on this work. After finishing or surfacing is done this entire work will be ready for tracklaying.

Roberts Bros. have started the tracklaying and are making satisfactory progress. The track has been laid as far as Taylorsville and at present rate of progress they will

FIG. 20—TROUBLE HUNTERS ON THE TRAIL, JUNE 14, 1919.

This is the Flying Squad of the Conservancy Electrical Department. They go all over the District. You may find them at the north end one day, at Lockington, and at Hamilton the next, seventy miles farther south. They take care of all pole line troubles excepting those of the transmission mains, which are handled by The Dayton Power and Light Company. Troubles like burned out armatures of electric motors, they do not take care of. These are brought in and repaired in the Conservancy shop.

not be long doing this work. The ballasting will then follow. They have a force of 90 men at work.

The elevating of the B. & O. main line and passing track south of Needmore Road, in which the District is interested, is thirty per cent advanced. The other B. & O. track work, which is being elevated at the same time, is twenty-five per cent completed.

Big Four and Erie. The big cut at Huffman will be excavated to its full depth and width by the end of the month. The cut being in rock is excavated one foot below the usual depth, the extra foot to be filled in with earth below the ballast, to give the necessary elasticity to the track.

The Ohio Electric cut adjoining the big cut is also very near completion. George Condon will finish the last cut on his work about September 1. He will then widen the embankments for about two miles west of Enon, these being now narrow. This will be done after the track is laid over these embankments. This will complete the grading east of the Montgomery-Greene County line. The Walsh Construction Company will then build about 90,000 cubic yards of embankment between Dayton and Harshmanville, which will complete all the grading on this work. The contract for the tracklaying and ballasting was awarded to the Walsh construction Co. The tracklaying was sublet by the Walsh Company to Roberts Bros. The steel rails and angle bars are already unloaded.

Ohio Electric Railway. The two stiff leg derrick "draglines" have moved across Mad River and will soon complete the grading of the roadbed between Mud Run and Carlisle Junction.

Contractor McCann will soon complete the grading between Fairfield and Mud Run.

The Mud Run concrete trestle and the abutments for the Mad River bridge are completed. The Smith Ditch concrete trestle is seventy-five per cent completed.

Preparations have been made for the receipt of track material for this railway, 600 feet of yard track having been laid.

Albert Larsen, Division Engineer.

August 19, 1919.

RIVER AND WEATHER CONDITIONS

The rainfall at the District's stations during the month of July varied from 3.96 inches at Fort Loramie to 5.23 inches at the Englewood and Taylorsville Dams. The streams were comparatively low during the entire month, although small rises of from 3 to 4 feet were caused in some of the streams by the rainfall of from 1.5 to 3.0 inches which fell on July 20. The number of days on which the precipitation exceeded 0.01 of an inch varied from 5 to 8 at the different stations. The total precipitation at the Dayton U. S. Weather Bureau Station was 4.20 inches, or .92 inches greater than normal, reducing the accumulated deficiency since January 1 to 1.63 inches.

At the Dayton U. S. Weather Bureau Station the mean temperature for the month was 77.0° F., or 1° above normal; there were 20 clear days, 9 partly cloudy days, 2 cloudy days, and 6 days on which the precipitation exceeded 0.01 of an inch; the average wind velocity was 8.0 miles per hour, the prevailing direction being from the southwest; and the maximum wind velocity for five minutes was 51 miles per hour from the northwest on the 31st.

Ivan E. Houk, District Forecaster.

August 25, 1919.

The Construction Program at Hamilton

2,000,000 Cubic Yards of River Excavation to be Handled by Dragline Excavators and Dump Car Trains.

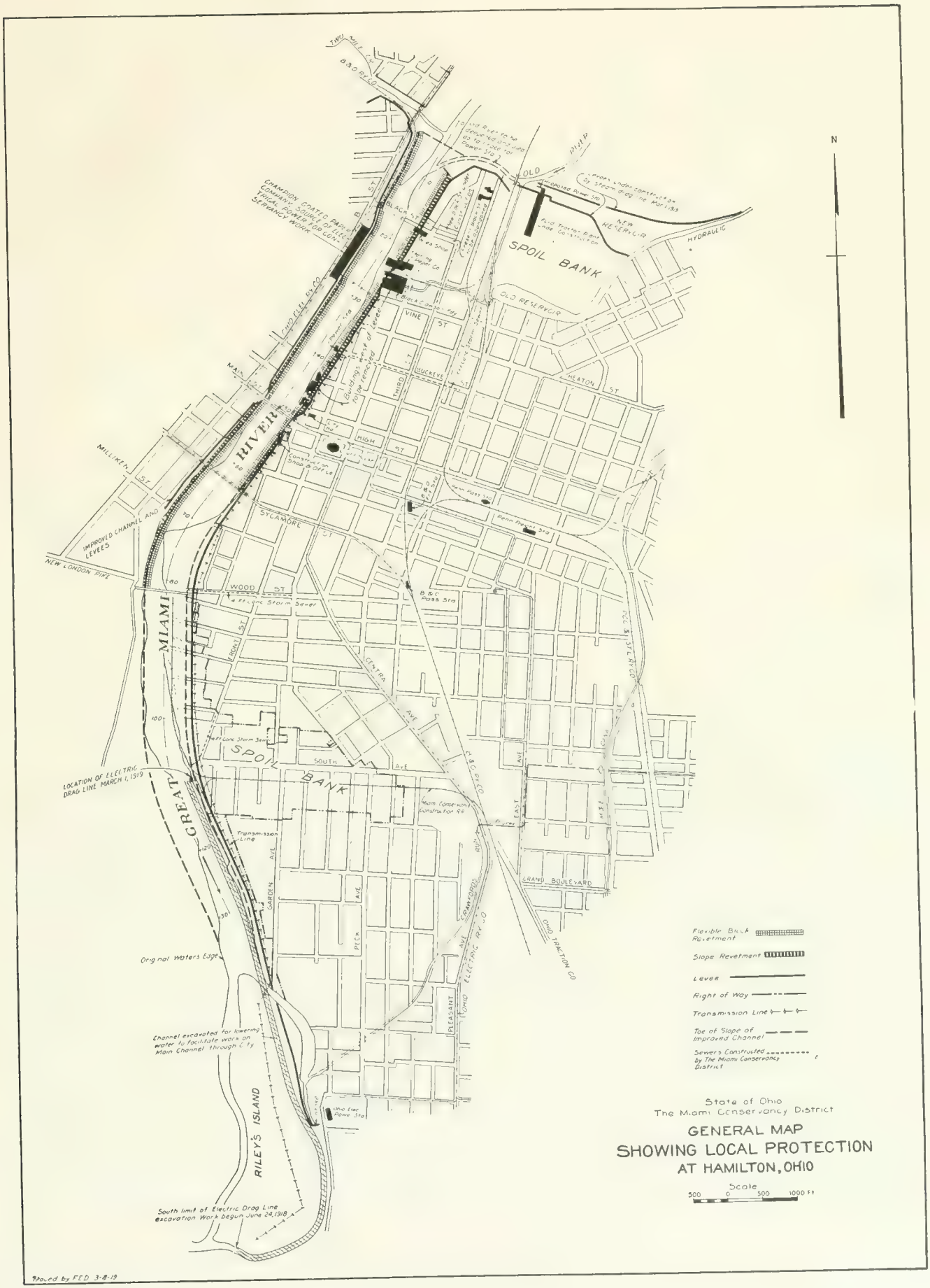
As indicated in the article in last month's Bulletin, the solution for the problem at Hamilton in general is to deepen and widen the present channel and to build levees along its banks, these levees and the adjacent edges of the channel to be lined with concrete.

This work called as a principal item for the excavation and transportation of nearly 2,000,000 cubic yards of earth, the transportation item being increased by the fact that the levees would require but a small fraction of the excavated material. The methods to be employed in these operations furnished the main construction problem.

As at Dayton, steam shovels, dragline excavators, dipper dredges and hydraulic dredges were all considered, dragline excavators being finally chosen as best. Steam shovels, considering that a considerable part of the excavation would be near or below water level, were early eliminated from consideration. The fact that much of the excavation was above water level eliminated dipper dredges. Draglines being able to do the work efficiently both in the dry and the wet were given the decision. The fact that a considerable part of the excavation has proved to be in very coarse gravel and boulders, which could not be economically handled by hydraulic dredging, has emphasized the wisdom of the choice. The dragline has also been advantageous in the handling of a considerable amount of bridge and car wreckage, relics of the 1913 flood, buried in the river bed.

A reference to the cross section of the channel, figure 23, will show a strip nearly 150 feet wide at the left, in which the excavation will be in the dry. This strip is about a mile in length. Crossing the river, it extends thence on the west bank nearly a mile and a half farther. It might be thought that this excavation could be done more economically by steam shovel. A study of the matter showed, however, that taking into consideration the labor of track shifting, the dragline, owing to its wide reach, will be superior even here. A steam shovel adapted to this bank could remove at one cut a section about 45 feet wide. The dragline in use (with 100 ft. boom and 4½-yard bucket) will take out at one cut a section 180 feet wide. The dragline will thus require in comparison, only about one-fourth the amount of loading track shifting in the course of the job, an advantage which outweighs the quicker swing and dumping action of the shovel.

At Dayton, as described in the Bulletin for May, materials are transported upon scows by stern-wheel tug-boat. At Hamilton the conditions make transportation by dump-car trains preferable. Three trains are in use, of ten cars each, drawn by 48-ton American, saddle-tank locomotives. One reason for the choice at Hamilton lies in the fact that the job at Hamilton is to a considerable degree a job of widening the channel rather than deepening it, as indicated in the section already mentioned, figure 23. During the rainy season this permits tracks to be used on top of the unexcavated shelf at the left in that section. There is no such shelf over most of the work at Dayton. Dump car train transportation at Hamilton has a further advantage in that it permits, by extending the construction tracks, the filling in of extensive low areas of the city. One of these areas, the north spoil bank, is that immediately adjacent to the new Fordson Tractor plant, at the north limit of the city. See page 27. The other


N
SPOIL BANK
OLD RESERVOIR
NEW RESERVOIR
HYDRAULIC
RIVER
MIAMI
GREAT
IMPROVED CHANNEL AND LEVEES
NEW LONDON PIKE
MILLIKEN ST.
SYCAMORE ST.
WOOD ST.
VINE ST.
HEATON ST.
BUCKEYE
THIRD
HIGH ST.
MAIN ST.
SOUTH AVE.
EAST AVE.
CENTRAL AVE.
GRAND BOULEVARD
GARDEN AVE.
PICK AVE.
CAMFORD AVE.
PLEASANT
RILEY'S ISLAND
LOCATION OF ELECTRIC DRAG LINE MARCH 1, 1919
Original Waters Edge
Channel excavated for lowering water to facilitate work on Main Channel through City
South limit of Electric Drag Line excavation Work begun June 24, 1918
Transmission Line
Flexible Block Revetment
Slope Revetment
Levee
Right of Way
Transmission Line
Toe of Slope of Improved Channel
Sewers Constructed by The Miami Conservancy District
State of Ohio
The Miami Conservancy District
GENERAL MAP
SHOWING LOCAL PROTECTION
AT HAMILTON, OHIO
Scale
500 0 500 1000 Ft
Placed by FED 3-8-19

The protective covering is of concrete. The sloping part covers the lower portion of the levee, and extends toward the top as far as may be necessary in each particular locality. It is 6″ thick, built in sections like a concrete sidewalk, and reinforced with galvanized steel wire mesh. The horizontal part (it really slopes slightly toward the center of the stream) is laid along the edge of the river bed. It is 35 feet wide and 5 inches thick, made in separate blocks woven together by galvanized steel wire rope strung through holes cast in them.

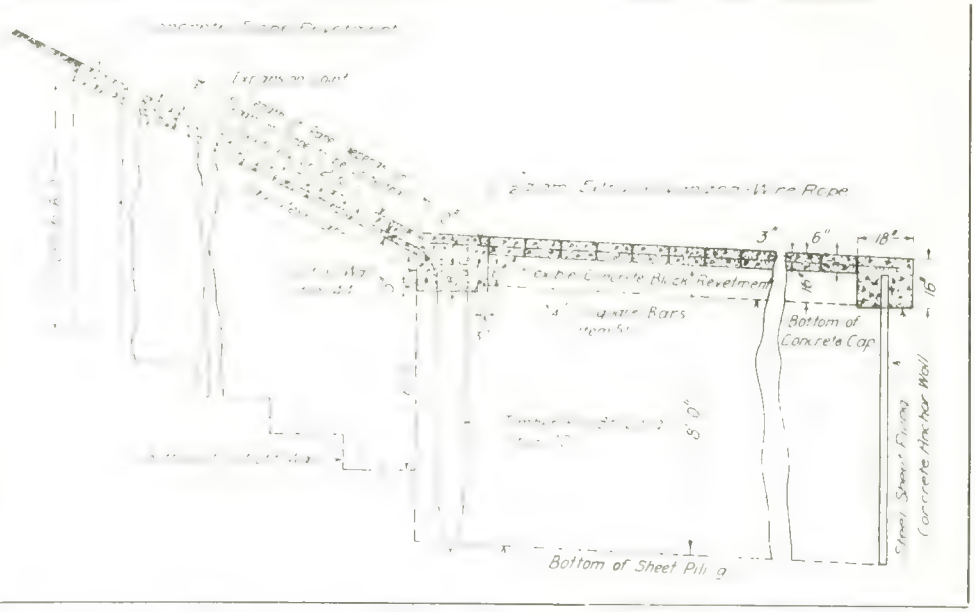


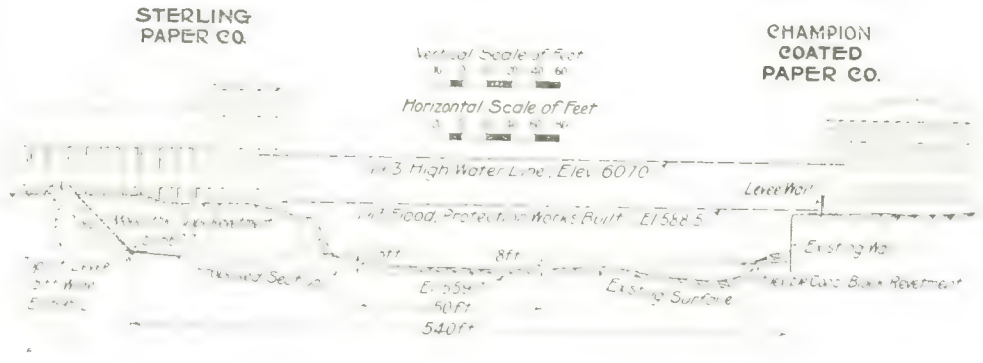
FIG. 22—CROSS SECTION OF CONCRETE REVETMENT, HAMILTON.

will become a much improved residential section (see area labeled "Spoil Bank" next the river in the southern part of the city). This latter area is three-fifths of a mile long east and west by a quarter of a mile wide north and south. Next the river it is over a mile long north and south. The north spoil bank is an approximate rectangle about 1,500 feet each way. The two areas together will receive about 1,500,000 cubic yards of excavated channel material.

During the dry months the construction tracks are located with more economy on the dry bottom of the old river bed, the stream flowing at one side in its narrowed summer channel. To lower the water surface and to narrow the flow still more, a deep water channel was dug for the stream by the dragline, beginning at the south end of Riley's Island, about 6,000 feet south of where the full river improvement begins. This channel is about fifty feet wide, the full width of the improved channel being 620 feet. It has lowered the river level about five feet, providing thus some additional margin for summer storm flow before the construction tracks would be flooded. This deep water channel has now been carried as far north as the railway bridge at Sycamore Street. In addition, a considerable amount of the final channel excavation has been completed and the material placed in a levee along the east bank. This work is indicated in figure 25.

The experience at Hamilton indicates that river excavation by dragline is best done with the machine moving down stream, especially where the water runs fast. The reason is that in working up stream a sharp slope in the water surface is always created where the excavation meets the unexcavated river bed. The bucket works always at this sharp slope, and the rush of the water down the slope washes away much of the loosened material and carries it down stream, where it fills up in part the already excavated channel. A double loss is thus involved. By working down stream the excavation creates a quiet current at the point of digging, and the waste becomes negligible.

The sewerage system at Hamilton discharging



This shows one of the two narrowest sections at Hamilton. The width here, foot of bank to foot of bank, is only 390 feet. This will be widened to 540 feet. The present ground surface is indicated by hatching. It will be seen that a considerable part of the Sterling Paper Company's building must be wrecked, and the ground beneath it excavated.

FIG. 23—NARROW SECTION OF RIVER AT HAMILTON.

into the river through a number of outlets, the flood protection plan naturally provides that these be protected with flood gates to be closed in time of high water. In addition the District is providing several new sewer outlets. The largest of these, on Buckeye Street, has a vertical diameter of 5 ft. 8 in. and a length of 2,000 feet, and is laid at a depth of from twenty to twenty-five feet below street level. This sewer is completed. A four-foot sewer 1,500 feet long has also been completed on Wood Street. A second four-foot sewer, on Front Street, about 700 feet in length, is in process of construction.

The taking of the 150-foot strip along the east bank of the river, necessary to the improved channel, involves the wrecking of several important structures. One of these is the power plant of the Hamilton and Rossville Hydraulic Company. This plant lies at the outlet of a canal which had been originally built in 1840 for the purpose of bringing water from the Miami River above the city, to furnish power to mills and factories, the fall thus secured being about twenty-five feet. The course of this canal is indicated on the map, page 27, where it is shown entering the city at the northeast corner and flowing southwestward into the Old Reservoir; thence westward to the Black-Clawson works on the river bank; thence south along the river to the power station at Buckeye Street, whence the water discharges through the water-wheels into the river. This canal in time of flood is clearly a source of danger, as affording a gate-way for flood water to enter the city. This source of danger the Conservancy engineers determined to remove entirely by extending the east river levee across the north end of th city to high ground, and carrying the canal to the river along the north side of this levee entirely outside the protected area. (See map, page 27). This involved rebuilding the power plant at a new location north of this new levee; also the construction of a new reservoir for power water storage north of the new levee and east of the proposed new location of the plant. The plan was the easier to carry out since the old power plant on the river at Buckeye Street had to be wrecked in any case, as already explained. The new power location is just north of the north "spoil bank," the low area to be filled with material excavated from the river heretofore referred to.

It is an interesting circumstance that in 1918, several years after this plan had been decided upon and in part carried into effect, the new power plant site should have been selected by Henry Ford as an excellent location for one of the new plants for the manufacture of the Fordson Tractor. He purchased a large part of the "spoil bank," together with a controlling interest in the Hydraulic Company. The tractor plant projected by him, and now in process of construction, is shown in the northwest corner of the spoil bank area. It will be a building of concrete and structural steel 600 feet in length

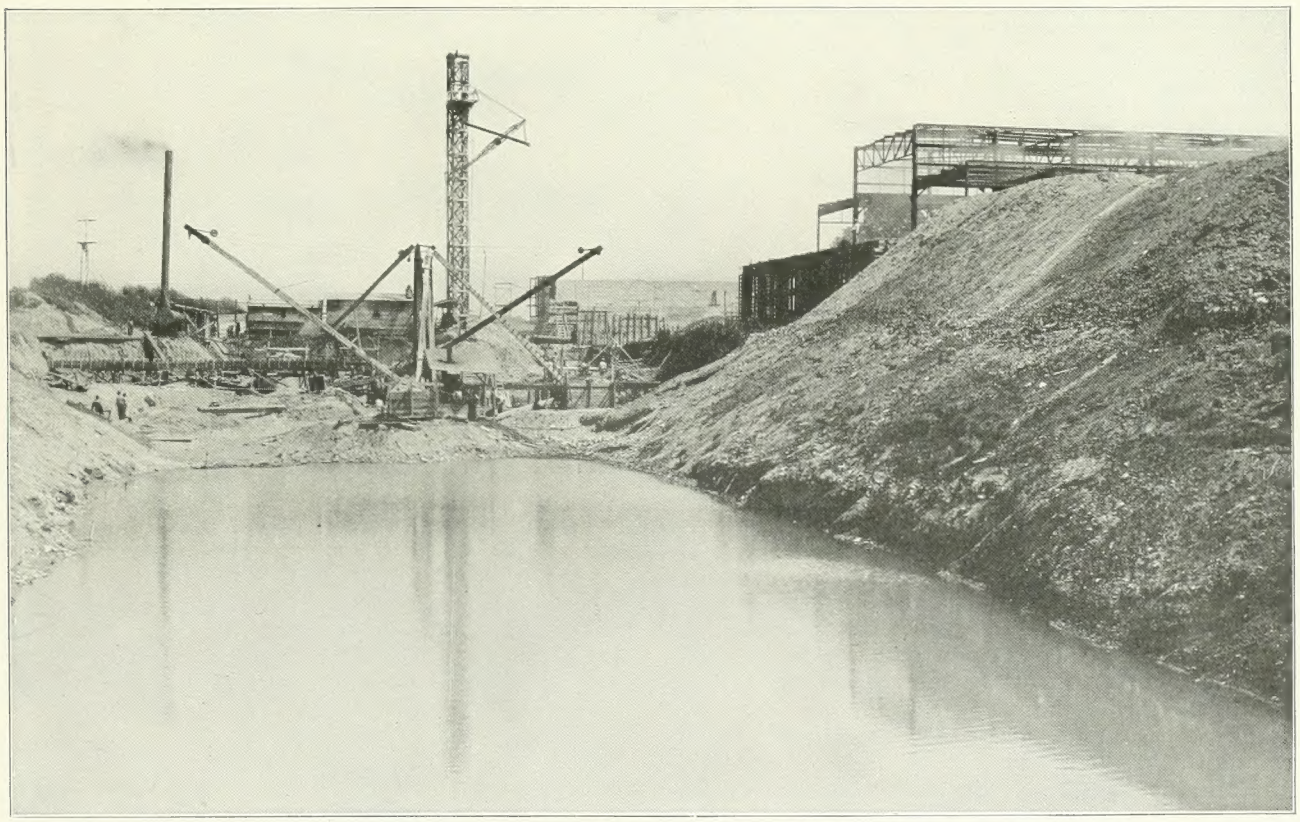
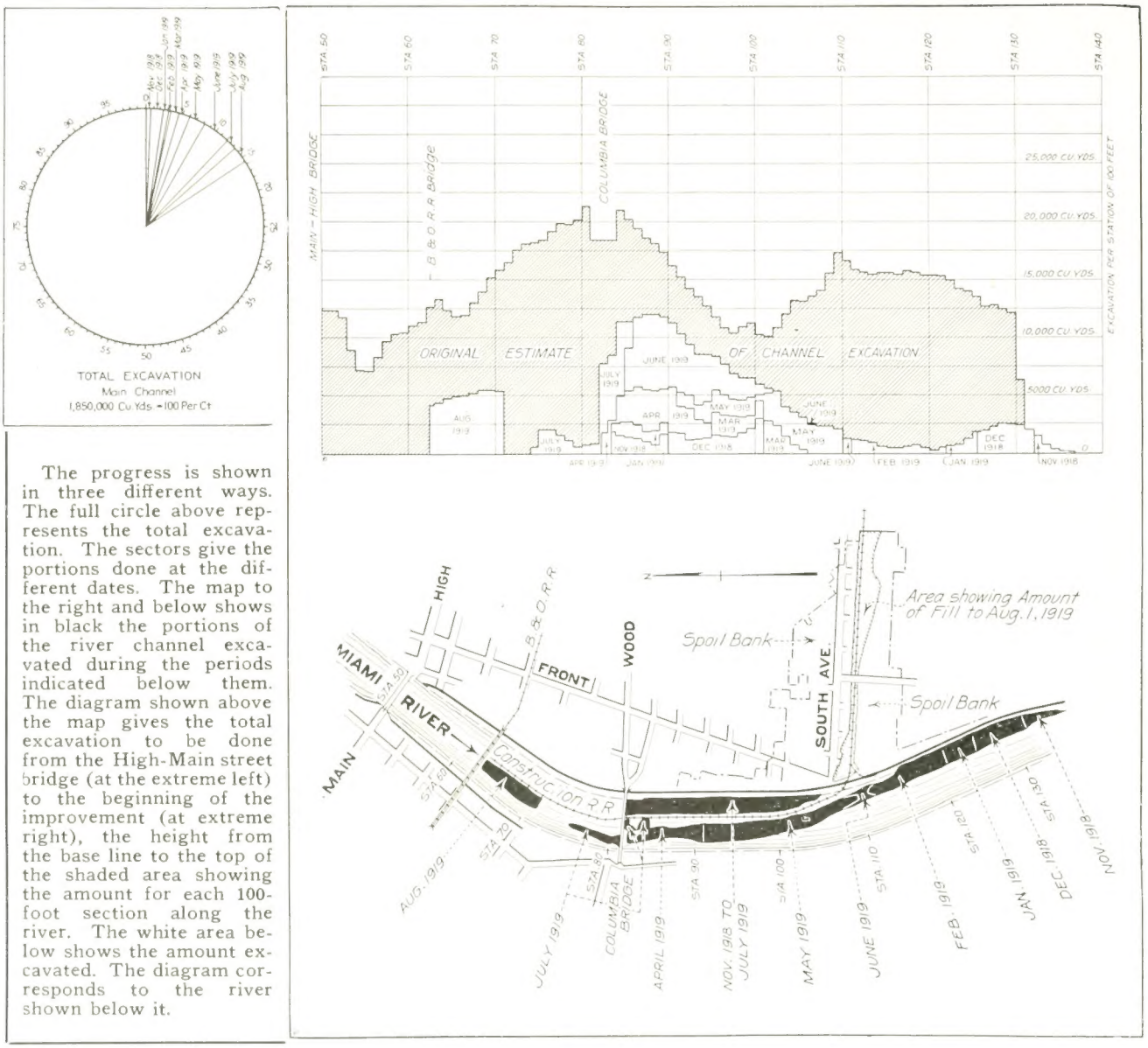


FIG. 24—PROTECTION LEVEE, TRACTOR PLANT AND NEW POWER PLANT, HAMILTON, AUG. 22, 1919

The view is a little south of east looking from the direction of the railway bridge across Old River, but a little nearer the Ford plant. (See Map, p. 27.) The protection levee on the north of the city is seen at the right. This will be carried around the north end of the Ford plant (seen just beyond it) by a concrete wall. Part of this wall is seen beyond the plant and at the right of the tower. The excavation in the foreground is for the water power tail race. The power plant foundations are now going in just beyond. The tower is used for elevating the concrete, which is then chuted by gravity into place. The head race and water reservoir are beyond the tower, between levees already built.



The progress is shown in three different ways. The full circle above represents the total excavation. The sectors give the portions done at the different dates. The map to the right and below shows in black the portions of the river channel excavated during the periods indicated below them. The diagram shown above the map gives the total excavation to be done from the High-Main street bridge (at the extreme left) to the beginning of the improvement (at extreme right), the height from the base line to the top of the shaded area showing the amount for each 100-foot section along the river. The white area below shows the amount excavated. The diagram corresponds to the river shown below it.

FIG. 25—PROGRESS ON THE RIVER EXCAVATION, HAMILTON, TO AUGUST 1, 1919.

by 150 feet in width. The new power plant, to be equipped with turbines developing 3500 H. P., is being built just to the north and outside of the protection levee. The tail race will discharge into the Old River, a former channel of the Miami, at the railway bridge, just west of the plant. The new protection levee at this point, and the levee north of it enclosing the new reservoir, have already been nearly completed, being a part of the regular Conservancy work. They are shown in part in figure 24, together with the excavation for the new power plant tail race and works accessory to it. By the original agreement the cost of the new head race and tailrace was to be paid for by the Conservancy District. The Ford plans require greater head and larger tailrace. The expense of these additions is borne by the Hydraulic Company. The cost of speeding up in the filling in of the low area, due to the new plans, is borne by the Ford Company.

The abandonment of the hydraulic canal through the city, while apparently a somewhat radical step, was negotiated with less difficulty than might have been expected. As a source of water power for industries the canal had little by little fallen into disuse in the course of years, until only a few factories were still absorbing power. These leases the Conservancy District purchased. The old tail race, into which these wheels still discharge, was also used as an outlet for storm sewers. The tail race being abandoned with the canal, it was to provide a channel for these storm water outlets that the Buckeye Street main sewer was built, referred to above.

The protective armour of concrete revetment, to be placed on the slopes of the levees and on a 35-foot strip of the adjacent river channel, is an important item of the construction. A general description of it was given last month. Figure 22 shows a typical section. The flexible concrete mattresses, on the channel slope, will require about 225,000 concrete blocks. These are 1 ft. by 2 feet in size and 5 in. thick, cast with two ¾-in. holes in the center of their thickness. Galvanized steel cables

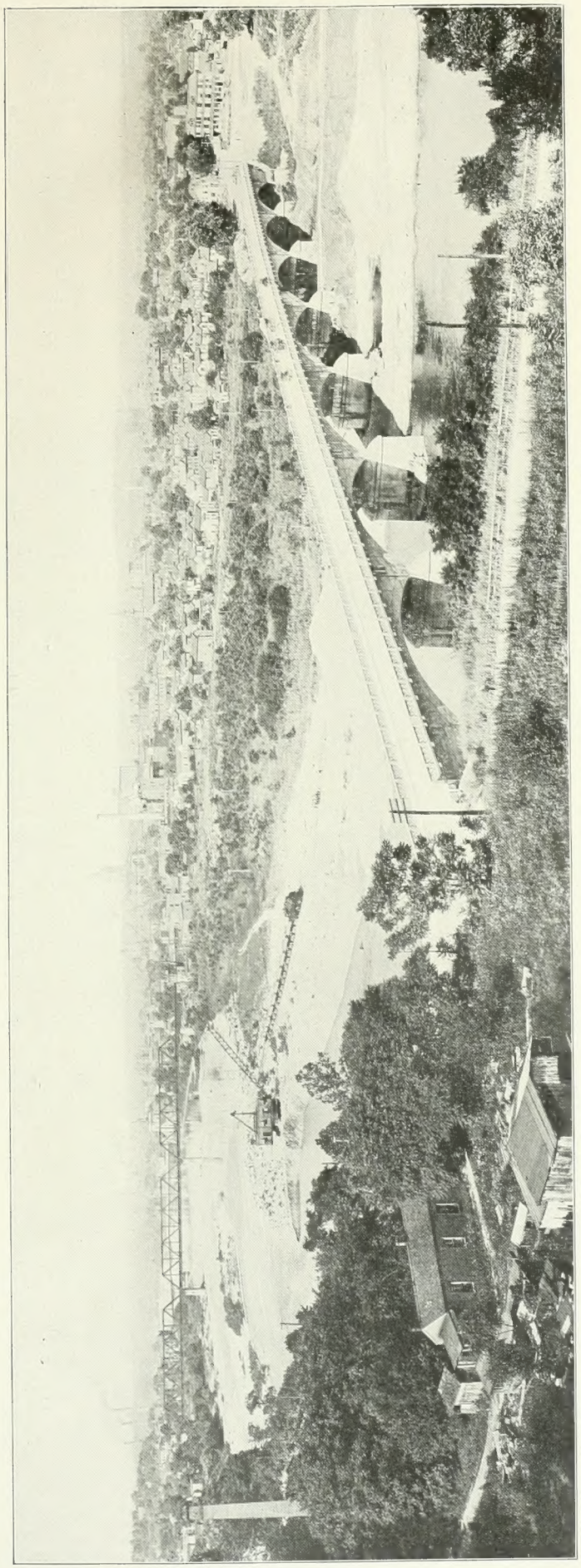


FIG. 26—WORKING ON THE RIVER EXCAVATION AT HAMILTON, JULY 29, 1919.

strung through the holes weave the blocks into a flexible fabric. The blocks and their manufacture were fully described in the August Bulletin. The machinery of the block plant, now working in Dayton, on completion of the work there, will be removed to Hamilton and set up beside the river. Excellent gravel in ample quantity occurs in the river bed at Hamilton in various localities. This gravel will also serve for the monolithic revetment, to be placed on the levee slopes, for the large concrete river walls and for the walls which will be used to top the levees in certain places where lack of space does not permit a wide enough embankment of earth. No large screening plant like those in use at the various dams will be used to assort the gravel. Instead, a smaller portable screen is contemplated.

Details of the various construction features will be given in later issues of the Bulletin.

The work at Hamilton is being carried out by C. H. Eiffert,, Division Engineer, R. B. McWhorter, Assistant Division Engineer, and R. H. Rains, Superintendent of Construction.

Opening of Conservancy Schools

The Conservancy schools will open again on September 2 for their second season of work. There will be some changes in the staff of teachers. At Huffman Miss Sara B. Darnell will be in charge; at Germantown, Miss Julia M. Darnell. At Taylorsville the work will be under Mr. F. E. Floyd and Miss Opal Floyd. At Englewood Mrs. Everdell will continue her efficient service of last year. Mr. and Miss Floyd are from Dayton, and the Misses Darnell from Manchester, Ohio. Mr. Floyd comes to the Conservancy from the U. S. army service, and was a teacher of successful experience preceding his war work. The Misses Darnell also bring to the Conservancy the advantage of several years of successful teaching. Mr. A. A. Hauck will continue in charge of all the Conservancy schools, giving to them this year, as last, a part of his time, the remainder the coming season being given to work on the staff of the Moraine Park school. This connection of Mr. Hauck cannot but be of advantage to the Conservancy schools, the unusual excellence of the work at Moraine Park being well known. Mr. Hauck's place as Camp Inspector will be taken by Mr. H. F. Moyer of the U. S. Employment Bureau at Columbus.

The work of the schools will be like that of last year, the satisfactory character of which is attested by the fact that the County Superintendent of Schools granted to all graduates of the eighth grade the regular Ohio State certificates, the same as granted to Dayton city schools. The irregularity unavoidable in the opening of the Conservancy schools last year will be avoided, however, at the present opening.

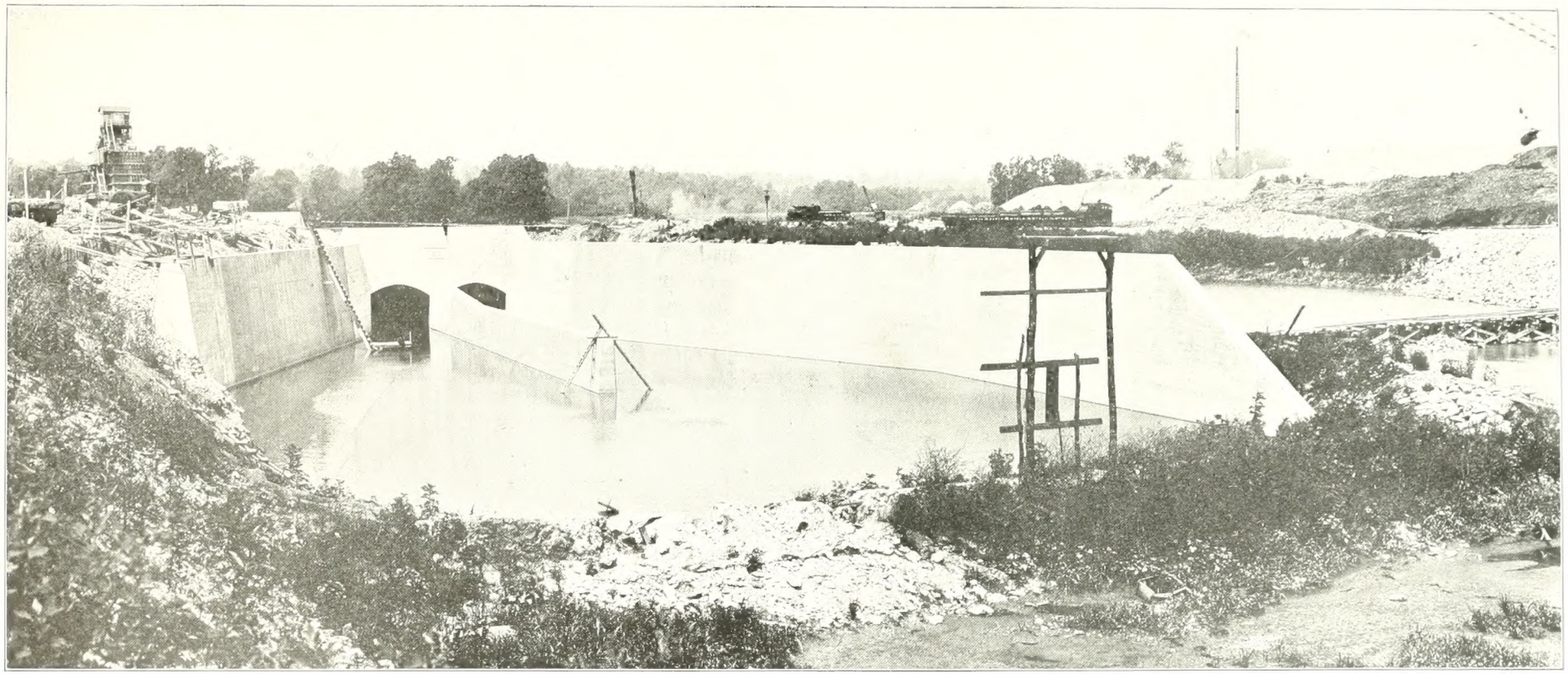


FIG. 27—STILLWATER RIVER COMING OUT OF THE ENGLEWOOD CONDUITS JULY 28, 1919.

The picture shows the conditions two days after the river was turned through the conduits. The exit for the water is not seen, being through a narrow channel hidden behind the embankment in the foreground, next to the river at the right. This channel is quite narrow, a large part of the river flow going through the tunnel to the monitor and dredge pumps and on through them to the hydraulic fill pool on top of the unfinished dam. The cross dam enclosing the river end of this pool is seen at the top and extreme right, with the bucket of the dragline excavator showing as a black spot at its right end, the boom, up in the extreme corner, being the only other portion of the excavator which appears. The top of this cross dam, July 28, the date of the picture, was 40 feet above the river level. The dragline machine referred to is used to build up this cross dam as the main dam rises, the materials being brought to it by dump car trains. One of these trains is seen bringing a load, just above the right hand wall of the conduit outlet. The material is dug by dragline excavators from the floor of the valley above the damsite, (in the distance in the left hand half of the picture). The boom of one of these draglines is seen against the trees to the right and above the conduit openings. The main part of this excavation, however, is carried to the "hog box" for the hydraulic fill.

The old location of the river is seen at the right of the right hand wall of the conduit outlet, with the water penned in by a dam, the timbers of which appear. A similar dam has been built across the old channel at the entrance to the conduits, about 1100 feet upstream, to divert the water into them. The water in the pool between the two dams has been pumped out since the picture was taken, and the bed of the river excavated practically down to rock, thus removing all material such as muck which might permit seepage of water along the old channel under the dam when completed. The top of the finished dam will be 122 feet above the old river bed.

The building at the left is the gravel washing and screening plant used in preparing this material for making the concrete of which the conduits are built. This plant, now temporarily idle, will be put to use again later for the concrete work of the spillway.

The water in the conduits appears about as it will after the dam is completed. The cross dam in the foreground, however, will then be removed. It was built tto keep the river water out of the conduits while they were under construction. Not more than half the present depth of the conduits is seen, the rest being under water. The lower half of the present depth will be filled with selected gravel and floored over as explained by Mr. McCurdy on page 22.